REMARKS

Upon entry of this paper, no claims have been amended, no claims have been canceled, and no claims have been added as new claims. Thus, claims 1-20 are presently pending in this application. No new matter has been added.

Applicant gratefully thanks the examiner for the indication of allowability of claims 13, 15, and 16 if rewritten according to the suggestions stated in the official action. However, applicant respectfully submits that all claims pending in the present application are allowable as described herein.

Summary of Invention in Pending Application

Prior to discussing the substantive rejections below, applicant wishes to provide a brief summary of some of the features relating to what he regards as his invention as claimed in the pending application. This Summary is not intended to convey all of the inventive aspects of the present invention. Instead, this Summary is intended to merely point out some of the features that have been identified as relevant to the rejections stated in the Office Action.

The present invention is directed toward a system for determining the presence or absence of an ion in a plasma an ion implantation system that employs an ion source for generating a plasma. The determination of the presence or absence of an ion is carried out by a probe assembly for detecting the ions at a local point of the plasma. The probe assembly includes a probe body and a focusing device or element for extracting the ion from the plasma, and a filter for filtering ions extracted from the plasma. As used herein, the term ion is intended to include any suitable ion and ion species created within the plasma chamber of an ion source.

Claim Rejecti ns under 35 U.S.C. §102

Claims 1-2, 4, 8-12, and 17-19

Claims 1-2, 4, 8-12, and 17-19 were rejected under 35 U.S.C. §102 as being anticipated by US Patent No. 6,504,159 to Keller (Keller '159). This anticipatory rejection is respectfully traversed in view of the following comments.

Keller '159 is directed toward development of a well-defined buried layer in a body of semiconductor material such as a wafer at high throughput and without developing non-annullable crystal lattice defects at a surface of the body of semiconductor material using a broad, substantially uniform ion beam. The beam is preferably provided by an electron-cyclotron resonance or bucket or multi-pole plasma source, which is allowed to produce ionization only when a stable acceleration voltage is present to provide a narrow spread of ion energies. High purity of ion population in the ion beam is provided by employing a high level of vacuum (e.g. fractions of a microTorr) in the implantation vessel or ion source and introducing ionizable material in substantially pure form. Thus, mass analysis of the beam is unnecessary for implantation of only a desired ion species. A magnetic filter may be employed to adjust relative populations of ion species. Arc breakdown can be avoided by increasing the length of the ion beam extraction column so that the implantation process can be conducted at a high duty cycle or even continuously.

Keller '159 fails to disclose an ion probe assembly. In fact, Keller '159 specifically states that such an assembly is unnecessary when it states that ". . . mass analysis of the beam is unnecessary for implantation of only a desired ion species." *See* Abstract.

More specifically, Keller '159 does not disclose a system or probe for ". . . determining the presence or absence of an ion in a plasma . . ." See claims 1, 12, and 17.

Keller '159 merely relates to a method of performing high speed ion implantation at improved throughput. There is no discussion in Keller '159 relating to a probe for extracting a small amount of ions from the plasma to assess the ions being implanted. Additional claim characteristics in each of claims 1, 12, and 17 are likewise absent from Keller '159, including those directed toward a probe assembly disposed in the plasma chamber for extracting and detecting ions (*see* claims 1, 12, and 17).

Anticipation can only be established by a single prior art reference teaching each and every element of the claimed invention performing the identical function in the same way. Applicant respectfully submits that claimed aspects of the present invention are conspicuously absent from Keller '159 and thus, there can be no anticipation.

Dependent claims 2, 4, 8-11, 14, 18, and 19 are likewise not anticipated by Keller '159 based on their dependency on allowable base claims, in addition to their own claim characteristics.

In light of the above comments, applicant respectfully submits that the claims of the present invention are not anticipated by, and are therefore in condition for allowance over, the Keller '159.

Claims 1, 4-5, 8-9, 11, and 17-19

Claims 1, 4-5, 8-9, 11, and 17-19 were rejected under 35 U.S.C. §102 as being anticipated by US Patent No. 5,113,072 to Yamaguchi et al. (Yamaguchi '072). This anticipatory rejection is respectfully traversed in view of the following comments.

Yamaguchi '072 is directed toward an apparatus for forming a device having a fine structure, the apparatus including a high intensity ion source. The apparatus can be used to form fine grooves and/or a fine film, by supplying a reactive gas to the surface to be etched or coated while irradiating a focused ion beam on the surface. A laser or

electron beam can be irradiated on substantially the same axis as that of the focused ion beam, whereby defects arising due to ion beam processing can be repaired. The apparatus can further include ion beam current detection and measurement structure to determine when a predetermined thickness of coating or depth of etching is achieved. The apparatus can include multiple chambers sequentially holding the surface treated, and can include a scanning electron microscope for scanning the surface being coated or etched.

Applicant respectfully submits that the structure of Yamaguchi '072 is unrelated to the claimed invention as claimed in claims 1, 4-5, 8-9, and 11. The claimed invention includes "an ion source having a plasma chamber sized and dimensioned for generating a plasma having an ion present therein" (*see* claim 1), and places the "probe assembly coupled to the ion source for detecting said ions of said plasma" (*see* claim 1). In other words, the probe assembly is "a probe device or element that extends within the plasma chamber of the ion source through an appropriate aperture in a wall of the source, and extracts ions therefrom." Specification, page 3, lines 30-33.

The device in Yamaguchi '072 is a device for forming a device having a fine structure. The apparatus can include an ion beam current detection and measurement structure to determine when a pre-determined thickness of coating or depth of etching is achieved. *However*, the detection and measurement in Yamaguchi '072 occurs *external* to the ion source and plasma chamber as discussed below. The device is <u>not</u> configured as ". . . a probe assembly coupled to the ion source for detecting said ions of said plasma . . ." *See* claim 1. The Yamaguchi '072 device can make use of the claimed invention, but is by no means equivalent, and cannot anticipate the claimed invention.

More specifically, Applicant respectfully directs the Examiner's attention to FIG. 1 of the pending application. In this figure, reference number 13 refers to an arrow indicating an ion beam being extracted from the ion source 12 and plasma chamber 14. The ion beam 13 in Yamaguchi is extracted from the very top portion of the vacuum

chamber 1201, which is not labeled, but surrounds the filament 1203. As such, if utilized in Yamaguchi '072, the device as claimed would be positioned in the top portion of the Yamaguchi device. The remaining components of Yamaguchi '072 simply modify and focus the extracted ion beam, *after it has already left the plasma chamber*, in preparation for cutting. As such, all of these components are external to the plasma chamber, which is different from the vacuum chamber 1201.

Applicant would like to again stress that the probe assembly of the present claimed invention is disposed *within* the plasma chamber where the ion source is located, not external to the plasma chamber. In further confirmation of the Applicant's interpretation of Yamaguchi '072, the ion source is labeled as ion source 1908 in Yamaguchi '072 (top of column 10). With the ion source 1908 positioned as indicated, the plasma chamber must be the small unlabeled enclosure around the ion source 1908. As such, there are no other components, or probes, located in or coupled to the space around the ion source 1908, thus Yamaguchi '072 cannot anticipate the claimed invention.

In addition, the only probe discussed in Yamaguchi '072 is charged particle detector 1221, which is external and substantially removed from the plasma chamber and ion source 1908. As such, this charged particle detector 1221 cannot anticipate the claimed invention.

Applicant respectfully requests the reconsideration and withdrawal of this rejection.

With regard to claims 17-19, claim 17 is directed to a "method for detecting an ion within a plasma generated within a plasma chamber of an ion source". Independent claim 17, and all claims depending therefrom, require that the probe detect ions directly from the ion source and surrounding plasma chamber, similar to claim 1. As such, the above remarks apply to the assertion of anticipation by Yamaguchi '072. In short,

Yamaguchi '072 does not disclose or teach a probe assembly for use in detecting an ion in a plasma *within* a plasma chamber holding an ion source.

Therefore, Applicant respectfully requests reconsideration and withdrawal of this rejection.

In light of the above comments, applicant respectfully submits that the independent claims of the present invention are not anticipated by, and are therefore in condition for allowance over, Yamaguchi '072. In addition, all claims depending from the independent claims are allowable based on their dependency upon an allowable claim, in addition to their own claim characteristics.

Claim Rejections under 35 U.S.C. §103

Claim 3

Claim 3 was rejected under 35 U.S.C. §103 as allegedly being unpatentable over Keller '159. This rejection is respectfully traversed in view of the following comments.

Claim 3 is directed toward the probe device having ". . . a probe body having a conical tip disposed within the plasma chamber, and a focusing element mounted to said probe body and adapted for generating a field, when energized, therein." See claim 3. Contrary to the assertion in the Office Action on page 7, ("the probe device comprises a probe body device (plasma grid in Figure 3)), there is no probe assembly in Keller '159. In fact, there is no plasma grid, per se, but rather an "extraction grid 310" with the difference being specifically pointed out in Keller '159 where it states that, ". . . [i]t should be recognized the function of the extraction grids 310 may function more to blank the beam than the embodiment of FIG. 2 in which the principle function of plasma grid 260 was to extract ions from the plasma (*sic*)." *See* Keller, column 8, lines 6-9.

Furthermore, the plasma grid 260 of FIG. 2 is not a probe. The plasma grid 260 has the purpose of being "used to establish a starting surface of the beam and may be flat or of any desired shape to accommodate such function." See Keller, column 7, lines 13-15. The plasma grid 260 is not a probe for extracting ions for measurement purposes. The plasma grid 260 serves as the main extraction source for the ions, not an extraction of ions for measurement purposes. The difference is that the plasma grid 260 is designed to extract far greater quantities of ions than the probe. Thus, Keller '159 does not teach or suggest the existence of a probe in the plasma chamber.

In addition, contrary to the Office Action statement that "Keller, however, suggests that any desired shape of the plasma grid can be used to accommodate the function of extracting ions." (See OA, page 7) Keller, in fact, does not make such suggestion. Keller '159 places the additional limitation that the resulting plasma grid must "accommodate such function" See column 7, line 15. The function referred to, again, is ionization to form the plasma, not extraction of small quantities of ions by a probe for measurement purposes.

Applicant respectfully submits that unless a *prima facie* case of unpatentability with respect to known facts is established, applicant is not obliged to proffer any evidence of nonobviousness. To establish a *prima facie* case there must be some suggestion or motivation, either in the prior art or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine multiple reference teachings. There must then be a reasonable expectation of success. Finally, the prior art reference or references (when combined) must teach or suggest all the claimed limitations.

Applicant respectfully submits that Keller '159 fails to teach or suggest every characteristic of the pending claims, including claim 3. Reconsideration and withdrawal of this rejection is requested.

Claim 20

Claim 20 was rejected under 35 U.S.C. §103 as allegedly being unpatentable over Yamaguchi '072 in view of US Patent No. 6,208,711 to Rand (Rand '711). This rejection is respectfully, but most strenuously traversed in view of the following comments.

As previously stated, Yamaguchi '072 fails to teach or suggest all elements of claim 17, including the lack of disclosure teaching a probe inside the plasma chamber with the ion source. Rand '711 does not correct this defect. As such, the combination of Rand '711 with Yamaguchi '072 fails to teach or suggest all claimed elements. Absent such a teaching, there can be no obviousness rejection.

Applicant respectfully requests the reconsideration and withdrawal of this rejection.

Claims 6 and 7

Claims 6 and 7 were rejected under 35 U.S.C. §103 as allegedly being unpatentable over Yamaguchi '072 in view of US Patent No. 4,789,787 to Parker (Parker '787). This rejection is respectfully, but most strenuously traversed in view of the following comments.

As previously stated, Yamaguchi '072 fails to teach or suggest all elements of claim 17, including the lack of disclosure teaching a probe inside the plasma chamber with the ion source. Parker '787 does not correct this defect, but rather is only directed to a filter type that can be used in conjunction with the claimed probe. As such, the combination of Parker '787 with Yamaguchi '072 fails to teach or suggest all claimed elements. Absent such a teaching, there can be no obviousness rejection.

Applicant respectfully requests the reconsideration and withdrawal of this rejection.

Applicant therefore respectfully submits that the cited references fail to teach or suggest every characteristic of Applicant's claims 3, 6, 7, and 20. Applicant further submits that all pending claims of the present invention are not obvious with respect to, and are therefore allowable over, the cited documents.

CONCLUSION

In view of the foregoing, it is respectfully submitted that this application is now in condition for allowance. Applicant courteously solicits allowance of the claims in the form of a Notice of Allowance. Should there be any outstanding issues of patentability following the entry of this response, a telephone interview is respectfully requested to resolve such issues.

Please charge any shortage or credit any overpayment of fees to our Deposit Account No. 12-0080. In the event that a petition for an extension of time is required to be submitted herewith, and the requisite petition does not accompany this response, the undersigned hereby petitions under 37 C.F.R. §1.136(a) for an extension of time for as many months as are required to render this submission timely. Any fee due is authorized to be charged to the aforementioned Deposit Account. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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